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MAY 12 2009

BDCO-09-02405

U.S. Department of Transportation
Docket Operations
West Building Ground Floor, Room W12-140
1200 New Jersey Avenue, SE
Washington D.C. 20590

DEPT OF TRANSPORTATION
DOCKETS

MAY 11 10 14 11

Dear FAA regulator:

Subject: Revised Petition for Partial Exemption from 14 CFR Sections 25.301, 25.303, 25.305, 25.601, 25.603, 25.613, 25.901(b.2), 25.901(c), 25.1301(d), 25.307, 25.1103(d) and 25.1191 as they relate to Thrust Reverser Inner Wall Structural Temperatures, Sufficient to Allow Independent In-Service Incorporation of Thrust Reverser and Engine Design Improvements

Model: All 777-200 and 777-300 with Rolls Royce Engines

BDCO Project No.: PS08-0691

EASA Project No.: TBD

EASA Level: Level 1 Major

Response Due: June 25, 2009

Reference(s):

- (a) Boeing Letter BDCO-08-04963, "Transmittal of the 777 Propulsion Comparison between the 777 T/R Partial RTO Exemption and the 777 T/R IP8 Thermal Exemption," dated October 30, 2008
- (b) Boeing Letter BDCO-09-00376, "Transmittal of Meeting Minutes for FAA/BDCO/BCA 777 Rolls Royce Thrust Reverser Inner Wall Thermal Issue Meeting," dated January 22, 2009
- (c) Boeing Letter BDCO-09-01643, "Petition for Partial Exemption from 14 CFR Sections 25.301, 25.303, 25.305, 25.601, 25.603, 25.613, 25.901(b.2), 25.901(c) and 25.1301(d) as they relate to Thrust Reverser Inner Wall Structural Temperatures, Sufficient to Allow Independent In-Service Incorporation of Thrust Reverser and Engine Design Improvements," dated March 31,



2009

(d) FAA Federal Docket Letter in response to
BDCO-09-01643, dated April 30, 2009

Special Instructions: The BDCO PA recommends the prime group at the SACO OMT for the subject be 140S – Propulsion. Please forward the letter and its enclosures to FAA Specialists M. Langsted and T. Thorson.



Response to FAA letter

In reference to the Boeing petition for exemption (ref c), the FAA has requested additional information (ref d) as follows:

- Please clarify the line numbers of the airplanes to which the exemption would apply.
- Please provide an explanation as to why you are not also seeking exemption from 14 CFR 25.307, 25.1103(d) and 25.1191.
- Please clarify whether your petition applied only to the three design improvements identified in your petition letter, or whether you are seeking broader applicability to all design changes made within the requested compliance time.
- Please remove any references to proprietary information, and then re-submit your petition to the Department of Transportation's Federal Document Management System (FDMS) under Docket No. FAA-2009-0320. Specifically, page 1 of the petition is identified as "Proprietary Enclosure for TAD letter only." Any files posted in FDMS are available to the public.

Requested Information:

The requested information is provided below:

- The line numbers of the airplanes to which the exemption would apply are listed below. These are the 777 Rolls Royce powered airplanes through LN 796 (224 airplanes)

14, 18, 25, 28, 30, 31, 32, 33, 42, 44, 47, 51, 54, 63, 64, 67, 74, 78, 83, 84, 86, 89, 90, 91, 94, 95, 100, 102, 113, 115, 118, 122, 126, 128, 136, 140, 144, 149, 150, 151, 153, 155, 156, 170, 171, 176, 180, 184, 185, 188, 190, 192, 198, 199, 202, 204, 207, 208, 209, 215, 218, 222, 223, 224, 225, 226, 231, 235, 237, 239, 241, 242, 244, 245, 248, 249, 250, 256, 257, 260, 261, 262, 265, 266, 268, 269, 270, 271, 272, 274, 275, 276, 277, 281, 283, 285, 287, 289, 292, 299, 300, 301, 303, 304, 308, 310, 311, 312, 313, 315, 316, 319, 321, 324, 325, 326, 328, 329, 330, 332, 333, 334, 335, 336, 337, 339, 341, 343, 345, 346, 348, 350, 353, 354, 355, 358, 360, 361, 363, 364, 366, 369, 371, 372, 374, 376,

378, 379, 387, 389, 390, 393, 394, 396, 398, 399, 402, 404, 405, 406, 407, 408, 409, 412, 414, 415, 418, 419, 420, 422, 428, 430, 431, 432, 433, 434, 438, 441, 444, 445, 447, 448, 449, 451, 456, 462, 470, 471, 479, 484, 485, 487, 496, 498, 503, 505, 513, 514, 515, 522, 534, 537, 546, 550, 555, 564, 566, 567, 575, 588, 591, 595, 596, 599, 605, 614, 648, 655, 665, 672, 771, 784, 791, 796

Note that Line Numbers 784, 791 and 796 have not yet been delivered.



- Upon review and discussion with FAA SACO, Boeing agrees that 14 CFR 25.307, 25.1103(d) and 25.1191 should be included in the petition for exemption.
- Boeing petitions that this exemption also apply to potential future product improvements or safety enhancements that may affect this same area of the thrust reverser.
- Proprietary information has been removed in the revised petition.

In addition, Boeing has recently become aware that certain pneumatic duct failure conditions may not have been adequately addressed in the certification of the original 777 Rolls Royce thrust reverser inner wall type design. Duct failures at high-altitude, low-airplane speed and low-engine-power conditions have recently been found critical for some aspects of the thrust reverser design on a different Boeing program. The design of the 777 Rolls Royce thrust reverser assumed that high-engine-power pneumatic duct failure conditions were critical for the inner wall. Analysis is now underway to verify this assumption but the analysis may not be complete in time to support the planned release of the thrust reverser and engine design improvements. In order to begin incorporation of these design improvements as soon as possible, Boeing is also petitioning for exemption from 14 CFR, sections 25.901(c) and 25.1103(d) for aspects of compliance associated with the new burst duct failure condition described above.

Petition for Partial Exemption:

Boeing is seeking a Partial Exemption for 14 CFR Sections **25.301, 25.303, 25.305, 25.601, 25.603, 25.613, 25.901(b.2), 25.901(c), 25.1301(d) and 25.307, 25.1103(d) and 25.1191** as they relate to Boeing Model 777 Rolls Royce thrust reverser inner wall structural temperatures and for 14 CFR sections **25.901(c) and 25.1103(d)**, as they relate to the high-altitude, low-airplane-speed pneumatic duct failure condition, for a time period of 6 years. This exemption is requested to allow independent implementation of type design changes to previously delivered airplanes in order to address an existing unsafe condition resulting from thrust reverser inner wall overheat and subsequent failure.

The revised petition for partial exemption is enclosed.

This letter is being sent for:

(X) Regulatory Review/Approval

Please contact this office or the following individuals if you have further questions:

(X) Project Administrator (PA): Ad Aboulhosn at (425) 266-9852

(X) Prospective Project Administrator (PPA): Alan Mair at (425) 717-8966

(X) Certification Specialist: Kathryn Dean at (425) 266-3308



Very truly yours,

for Ad Aboulhosn
J. B. Zundell

Lead Project Administrator, Production & Retrofit Projects
(425) 965-3531, MC 67-LR
FAX: (425) 294-9340

Enclosure(s):

1. Revised Petition for Time-Limited, Partial Exemption to Title 14 Code of Federal Regulations (CFR) sections 25.301, 25.303, 25.305, 25.307, 25.601, 25.603, 25.613, 25.901(b.2), 25.901(c), 25.1103(d), 25.1191 and 25.1301(d) for Model 777 Rolls Royce Powered Airplanes

cc:

Name	Enclosures	EDT	Comments
K. Patel	No	No	(FAA) 6Y-01
M. Langsted	Yes	Yes	(FAA ANM-140S) 6Y-01
T. Thorson	Yes	Yes	(FAA ANM-140S) 6Y-01
Ron May	Yes	Yes	(FAA ANM-100S) 6Y-01
STD FAA CP DIST	Yes	Yes	

Revised Petition for Time-Limited, Partial Exemption to Title 14 Code of Federal Regulations (CFR) sections 25.301, 25.303, 25.305, 25.307, 25.601, 25.603, 25.613, 25.901(b.2), 25.901(c), 25.1103(d), 25.1191 and 25.1301(d) for Model 777 Rolls Royce Powered Airplanes

Petition for Time-Limited, Partial Exemption

Boeing hereby petitions for a partial exemption from 14 CFR sections **25.301, 25.303, 25.305, 25.307, 25.601, 25.603, 25.613, 25.901(b.2), 25.901(c), 25.1103(d), 25.1191 and 25.1301(d)** as they relate to Boeing Model 777 Rolls Royce thrust reverser inner wall structural temperatures for a time period of 6 years. This exemption is requested to allow independent implementation of type design changes to previously delivered airplanes (through Line Number 796) in order to address an existing unsafe condition resulting from thrust reverser inner wall overheat and subsequent failure.

Discussion

The Model 777 Rolls Royce thrust reverser inner wall has experienced structural failures some of which have resulted in parts departing the airplane. The root cause of the failures has been determined to be thermal damage to the composite honeycomb sandwich inner wall structure. Two separate, independent causes for thermal damage have been identified: hot air ingress behind the thermal blankets which protect the inner wall from the engine core compartment environment; and engine intermediate pressure compressor 8th stage (IP8) stability bleed exhaust air impingement on the fan air flow side of the thrust reverser inner fan duct wall.

In Feb 2005 Boeing released Service Bulletins 777-78A0059 and 777-78-0060 which provided instructions for inner wall structural inspection for thermal damage and sealing of the thermal blankets respectively. These service bulletins were the subject of Airworthiness Directive (AD) 2005-07-24. Subsequent to the incorporation of these bulletins Boeing became aware that: 1) the specified sealant was not sufficiently durable in the engine core compartment thermal environment; 2) the inner wall structural inspections that were accomplished could have failed to identify and repair all significant areas of damage; and, 3) even with blankets properly sealed per the service bulletin, inner wall structural temperatures could exceed design limits due to continued hot air migration under the blankets. As a result Boeing released service bulletin 777-78A0065 in June 2008 which specified additional repeat inspection of the sealant and of the inner wall structure. The FAA is in the process of rulemaking activity to mandate by AD this service bulletin.

In November 2007 Boeing began designing a thrust reverser inner wall thermal protection system modification which includes new thermal blankets and other inner wall cooling provisions. Validation testing was completed in Sept, 2008 and new blankets are being manufactured.

In December 2007 Boeing received data from an operator indicating that engine IP8 bleed exhaust air had caused thermal damage to the thrust reverser inner wall downstream of the bleed port. Flight testing of several airplanes with thermally sensitive paint on the thrust reverser inner wall confirmed that the exhaust impingement resulting from normally operating IP8 bleed valves causes structural temperatures on the thrust reverser inner wall to exceed design limits. The improved thrust reverser thermal protection system now being designed cannot address this additional and independent source of thermal damage. Rolls Royce is currently developing a reconfigured exhaust screen to mitigate the effects

screen to mitigate the effects of exhaust flow to the thrust reverser. However, this redesigned exhaust duct screen is not expected to be certified and available to the fleet until late 2009 at the earliest.

Boeing is currently planning for a fleet retrofit program envisioned as two separate phases to be implemented as design improvements become available:

In the first phase, prior to the availability of a redesigned engine IP8 bleed screen, the new thrust reverser inner wall thermal protection system would be incorporated by Boeing Service Bulletin 777-78-0071. Incorporation of the change would involve replacing the thermal insulation blankets and adding cooling provisions to the thrust reverser inner wall. Incorporation of this service bulletin will significantly reduce thrust reverser inner wall structural temperatures. The first release of this bulletin will not incorporate thermally insulated covers over the blanket retention studs. These covers address a potential compliance shortfall related to local temperature rise under the stud. These covers will not be available at the time of the bulletin release. A future revision of the bulletin will be made to include the covers once they are available. Compliance time for this service bulletin is estimated at 5 years paced by thermal blanket manufacturing capacity.

In the second phase, operators would incorporate an improved IP8 bleed screen once Rolls Royce has a service bulletin available. The improved thrust reverser inner wall thermal protection system and IP8 bleed screen would preferably be installed concurrently when possible. However, due to differences in bleed screen and thermal blanket production rates, as well as differences in airplane incorporation opportunities and engine changes, operators may choose to incorporate one change before the other. Compliance time for this IP8 bleed screen replacement Service Bulletin is estimated at 5 years.

Note that incorporation of either or both of these service bulletins would not provide terminating action for the repeat inner wall structural inspections specified in 777-78A0065. Since current composite inspection methods are not sufficiently sensitive to detect the early stages of thermal damage, repeat inspections will remain in place to mitigate the risk of damage propagation from areas of existing but undetected thermal degradation. As a follow-on action, Boeing is planning to issue a service bulletin to either replace the thrust reverser inner wall or inspect the inner wall for possible thermal damage with improved composite inspection methods (currently under development) and repair as required. This follow-on service bulletin will require prior or concurrent incorporation of both the improved thrust reverser inner wall thermal protection system and the improved RR engine IP8 bleed screen, and would provide terminating action for the repeat inspections specified in 777-78A0065.

Additionally, Boeing has recently become aware that certain engine duct failure scenarios may not have been adequately addressed in the original certification of the 777 RR thrust reverser. Duct failures at high-altitude, low-airplane speed conditions have recently been found critical for some aspects of the thrust reverser design on a different Boeing program. The design of the 777 RR thrust reverser assumed that high-power conditions were critical for the pneumatic duct failure scenario. Analysis is now underway to verify this assumption but the analysis may not be complete in time to support the planned release of the thrust reverser and engine design improvements. In order to begin incorporation of these design improvements as soon as possible, Boeing petitions for exemption to the aspects of compliance to 25.901(c) and 25.1103(d) associated with the new burst duct failure condition described above.

Boeing is petitioning for Exemption from 14 CFR sections **25.301, 25.303, 25.305, 25.307, 25.601, 25.603, 25.613, 25.901(b.2), 25.901(c), 25.1103(d), 25.1191 and 25.1301(d)** as they relate to thrust reverser inner wall structural temperatures, sufficient to allow independent incorporation of the following thrust reverser and engine design improvements on 777 Rolls Royce-powered airplanes through LN496:

- Improved thrust reverser inner wall thermal protection system. This change incorporates new thermal blankets and new cooling provisions
- Improved engine IP8 exhaust bleed screen.
- Improved thrust reverser blanket retention stud insulation.

Boeing also petitions for Exemption from 14 CFR sections **25.901(c) and 25.1103(d)**, as they relate to the pneumatic duct failure condition described above.

Boeing petitions for exemption sufficient to allow incorporation of the type design changes listed above in any order and combination. Within the requested time period, incorporation of all changes across the entire 777 RR fleet will be completed and compliance for the recently discovered duct failure condition will be shown during the period of incorporation, the in-service fleet will still be subject to the inspections required by S/B 777-78-A0065. In addition, Boeing petitions that this exemption apply to potential future product improvements or safety enhancements that may affect this same area of the thrust reverser.

Justification

Effect on Safety

Granting this exemption would provide a reduced risk of a hazardous thrust reverser inner wall failure event by allowing incremental design improvements to be incorporated as they become available. Boeing will show that the risk associated with the potential non-compliance for the burst duct condition is small and that approval of the exemption will improve overall fleet safety.

Public Interest

- (a) It is in the interest of the public that airplane design improvements which improve safety are allowed to be implemented while additional improvements are being developed.
- (b) The cost of continued repeat inspection of the blanket sealant and inner wall structure are significant. Implementing improvements as quickly as possible will reduce the financial impact and operational disruption to the operators.

Request

Boeing hereby petitions for a time-limited, partial exemption from 14 CFR sections **25.301, 25.303, 25.305, 25.307, 25.601, 25.603, 25.613, 25.901(b.2), 25.901(c), 25.1103(d), 25.1191 and 25.1301(d)** as they relate to thrust reverser inner wall structural temperatures and from 14 CFR sections **25.901(c) and 25.1103(d)**, as they relate to the high-altitude, low-airplane-speed pneumatic duct failure condition, sufficient to allow independent incorporation of thrust reverser and engine design improvements described above for a period of 6 years

Name and Address of the Petitioner

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